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READ ALL ABOUT IT! THE INTERPRETIVE VALUE OF NEWSPAPER FROM OLD UNIDENTIFIED DINOSAUR QUARRIES AND PALEONTOLOGICAL FIELD CAMPS IN ALBERTA, CANADA

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ABSTRACT

Early fossil collectors in southern Alberta, Canada were not always environmentally conscious. Trash generated in field camps or in fossil quarries was often discarded on site. Some of the garbage was deliberately buried, covered by eroded sediments derived from nearby outcrops or through pedogenesis. Garbage, such as lumber, nails, tin cans, crockery, glassware, plaster, burlap and newspaper are now being re-exposed as the sediments erode away. The interpretive value of this trash has been exploited over the past decade. Many unidentified old dinosaur quarry sites are known to exist but what was collected, by whom, and when is often unknown. Identifying these "mystery quarries" is critical as various data learned from them can be utilized in current dinosaur biostratigraphic studies. Sourced and dateable newspaper is the most valuable garbage item left behind. Because each edition of a newspaper is completely different from all others, even small fragments recovered from mystery quarries can be identified though microfilm or online comparisons. The year and publisher of the newspaper can be directly linked to the year of the excavation and sometimes identity of the museum involved (e.g. 1927 Toronto Star newspaper = 1927 Royal Ontario Museum expedition). That information, coupled with other lines of evidence such as spatial and stratigraphic occurrence, bones left on site, and historical evidence can often lead to a rapid and accurate identification of a mystery quarry. Currently over 25% of all pre-1955 quarries in Dinosaur Provincial Park have been solved this way. A case report, dealing with the discovery and eventual identification of a WWI quarry in Dinosaur Provincial Park that yielded a rare *Centrosaurus* skeleton is outlined.

INTRODUCTION

In the southern Albertan badlands, old (1955 and older) dinosaur quarries are occasionally relocated, but because of incomplete documentation, who was there, when and what was collected is often unknown. These sites are known as "mystery quarries". Knowing what was collected there is important, as the complementary historical, sedimentological, geological and critical stratigraphic data can then be utilized in other studies (e.g. Currie and Russell, 2005). Additionally, bones missed by the original collectors become exposed by ongoing erosion and need to be collected and reunited with the rest of the skeleton (e.g. Tabrum, 2006; Wahl et al., 2006). Relocation of field camps is also important as pre-1921 expeditions in Alberta lacked motor vehicles and camped close to their dig sites. In the quarries and field camps, early collectors often left trash such as tin cans, nails, lumber, glassware, crockery, burlap, plaster of Paris, and newspaper behind. Today, this garbage can be found on the surface or located subsurface by metal detector (Tanke, 2005b, 2006).

How early paleontologists dealt with their trash is not well known. In 1917, an ornithologist visiting the Charles H. and Charles M. Sternberg camp in what is now Dinosaur Provincial Park, described garbage disposal practices there: "At Camp 11 a nearby creek bed cut down some twelve feet below the general level and dry and parched in the sun was the repository of our empty cans and table scraps." (Taverner, 1919:252). The location of this campsite is well known today and it can be seen that after a rain, the accumulated garbage would be swept away by the ephemeral stream into the nearby Red Deer River. Ongoing research by the author in the relocated 1919-1920 Dinosaur Provincial Park camp of amateur collector William E. Cutler shows he buried his trash in a pit and left some on the surface. The recently relocated 1925 Geological Survey of Canada field camp several miles below Tolman

Bridge, AB showed that tin cans and campfire charcoal remnants were dumped in an elongated depression on a slope immediately behind camp. An inspection of the 1930 Royal Ontario Museum camp near Iddesleigh, AB shows trash was simply dumped into the badlands behind their tents. Simpson (1978) shows his 1929 camp in New Mexico with tin cans simply scattered about the living area. Trash disposal in early 20th Century paleontological camps seems to have been a rather haphazard affair.

Here is presented a case report to outline the types of research required to solve a mystery quarry found in Dinosaur Provincial Park, AB. It is provided to show the methodology and rationale used to solve such sites. Not all mystery quarries have been identified exactly this way, but this is a typical example where recovered old newspaper is involved.

Abbreviations—AMNH (American Museum of Natural History, New York, NY); DPP (Dinosaur Provincial Park, AB); FMNH (Chicago Field Museum, IL); GSC (Geological Survey of Canada, Ottawa, ON); ROM (Royal Ontario Museum, Toronto); TMP (Royal Tyrrell Museum of Palaeontology, Drumheller, AB).

USE OF OLD NEWSPAPER TO IDENTIFY CAMPS AND QUARRIES

Early fossil collectors relied heavily on newspapers for information, more so than their contemporaries today. In remote locations in early 20th Century Alberta, telegraph and telephone access was very limited, radio and television non-existent. News was obtained via the daily newspaper, the only readily accessible source for information on the outside world. In the field, newspaper was used not only for reading, but also served secondary functions as toilet paper, separator in larger plaster jackets, packing material, and for making small string-tied packages of fossils (Tanke, 2005a:fig. 2.2). Excess newspaper like other trash was discarded, only to become buried through pedogenesis (in grass-covered camps), or by quarry rock rubble, where it is exposed by erosion many decades later. Once buried, especially in a quarry situation, newspaper is protected from sunlight, wind, rain, insects and rodents. Each edition of any given newspaper is unique from all others. Because of this, even newspaper fragments as small as a fingernail can be accurately identified through microfilm or online comparisons. Datelines, folio data, news stories, personalities, obituaries, cartoons (with their copyright and issuance date), sports scores, font, and layout style can all be researched and used to identify the exact vintage and source of the newspaper. This in turn provides the date of the quarry (or camp) because in the author's experience, the year of the newspaper is always the same year as the quarry was excavated. The oldest newspaper recovered from DPP quarries dates back to the summer of 1914, though 1911-1913 examples could also be expected. Less certain is newspaper possibly left behind by smaller, earlier expeditions from 1889 (T.C. Weston, GSC); 1897, 1898, 1901 (L.M. Lambe, GSC). Table 1 identifies the types of newspapers and sources found in old camps and quarries in DPP.

TABLE 1. List of newspaper types and one magazine found in paleontological field camps and quarries in Dinosaur Provincial Park, Alberta. In DPP, W.E. Cutler used yet unidentified British-based newspaper for field specimen labels, and the FMNH crew used Chicago Sunday Tribune newspaper dated August 6, 1922 to wrap fossil specimens, so recovery of newspaper of these types in DPP camps/quarries could also be expected.

Daily Morning Albertan (Calgary)	The Calgary Daily Herald
Edmonton Journal	Farm and Ranch Review (Calgary)
Lethbridge Herald	Manitoba Free Press (Winnipeg)
The Evening Telegram (Toronto)	The Globe (Toronto)
Toronto Daily Star	Ottawa Citizen

When dealing with newspaper fragments in mystery quarries, where the paper was published is also important. It is unlikely that a crew from New York City would have Ottawa-based newspapers with them or vice versa. They would likely prefer local papers or those from home forwarded by family and colleagues. Discovery of Ottawa Citizen newspaper fragments in a mystery quarry would thereby imply GSC involvement. Using this logic, 1916 Evening Telegram (Toronto) newspaper fragments accurately linked Levi Sternberg to quarry 196 (Tanke et al., 2002). Calgary-based newspapers were readily available to all collectors in southern Alberta, so are not useful in this regard, but still provide the year of publication data. Similarly, a large section of buried 1922 newspaper bearing a George F. Sternberg address label correctly linked him to quarry 69, excavated that summer (Tanke, 2005a:fig. 2.3).

DESCRIPTION

Mystery quarry 1 was initially located by TMP staff in the core area of DPP around 1996. It was a large quarry (Figure 1A), measuring 6.1 m (20') long, 2.1 m (7') wide, and a back wall ranging from

1.2 m (4') to 3.35 m (11') high. On the floor of the quarry lay several lengths of old rotted Cottonwood (*Populus deltoides*) tree trunks (Figure 1B), all heavily corroded and encrusted with lichens. Pieces of plaster of Paris, crumbly burlap, a short length of milled lumber bearing several nails, and rusty fragments of a fuel tin were also found on site. The soldered-on pour spout and the can's size/shape is similar to those seen in the AMNH 1910 *Albertosaurus* bonebed far upriver at Dry Island and a 1930 ROM *Centrosaurus* site (quarry 44, DPP). Locally-derived tree trunks were used as splints within larger field jackets. This was a common practice early on and occasionally utilized today. Compared to DPP dinosaur quarries of known age (Sternberg, 1950; Tanke, 1994), the degree of rock erosion on the quarry walls (Tanke, 2001) and advanced degree of lichen growth on the tree trunks indicated mystery quarry 1 was an old site, estimated at being WWI vintage. But whose quarry was it?

This information remained elusive until 2005. That summer, after unusually heavy rains, the site was revisited and the author discovered a small wad of old newspaper eroding out of the quarry's scree slope. This was carefully extracted with a paring knife and the surrounding area excavated for more paper although none was found. Reexposed broken dinosaur limb bone fragments and pieces of three ceratopsian pedal phalanges were scattered about the quarry floor, indicating this was a horned dinosaur quarry. All phalanges were incomplete, bleached white by years of sun and rain exposure, and one piece was heavily encrusted in lichens- again indicating that it had been on the surface for many years. In 2006, two badly eroded but articulated ceratopsian distal caudal vertebrae were recovered from the quarry.

Back in camp, the meticulous process of cleaning and separating the newspaper began. After many decades of rain and erosion, the newsprint pages were glued together with dried mud and silt, making them difficult to separate. Parts of several pages were present, all folded and mashed together, much as a crumpled ball of scrap paper. First, the excess dried mud was carefully removed. The newspaper was then placed in a small container which was filled with warm tap water. The submerged mass was allowed to soak for about 15 minutes. While underwater, the newspaper was further cleaned with jets of water squirted from an eyedropper. The sodden paper was then carefully removed and placed on dry paper towel and allowed to sit undisturbed for about 10 minutes. Then the process of carefully removing any remaining mud and teasing the wet pages apart piece by piece ensued, using dental tools, toothpicks, and a steady hand. The paper was periodically resoaked (either by eyedropper or total emersion) and again placed on dry paper towel, paying particular attention to the consistency of the newspaper to ensure it did not completely return to its original pulp constitution. The soaking, cleaning, and page separation procedures took about 2 hours.

As the fragile newsprint page pieces came apart, important clues began to be revealed. While some advertisements were complete, no news or sports stories were. The advertisements page featured a partial cartoon image of what appeared to be an early 20th Century policeman, with the name **WANTS** appearing on the front of his cap (Figure 2, left). An attached corner piece indicated it came from pages 21 and 22. Advertisements in the classified ads covered western Canada, but most centered on Manitoba, especially its capital of Winnipeg where a majority of businesses listed Portage Street as their location. Several brief sports stories provided additional clues. The first, bearing a June 10 dateline described a football (soccer) match between Moosomin and Broadview, two small towns in SE Saskatchewan. The second article used Wednesday in the past tense, suggesting the paper was not a Wednesday edition. The final article noted that the AAU (American Athletic Union) convention the following year would be held in Ottawa. An advertisement for W.H. Herbert, J.L. Levin, and E.H. Boyd at 704 Merchant Bank Building listed themselves as: "Largest and Oldest Exclusive Business Sellers in Western Canada". Finally, a partial news story spoke of a man, simply identified as Dillingham, who was an American consul general. These were all the useful clues that could be gleaned.

After having worked with newspaper from other old quarries in DPP, it was soon apparent from the font used and arrangement of stories and advertisements that this was not an Albertan newspaper. The dominance of Winnipeg advertisements suggested it was published in that city. When the author returned from the field, internet research was conducted. The AAU and company at the Merchant Bank Building were dead leads as nothing could be found online about them. Research into the early history of soccer in Canada indicated most teams were disbanded during WWI, suggesting the quarry pre- or postdated that conflict. The final clue turned out to be the most important one. The terms "Dillingham" and "consul general" from the newspaper fragments were entered on the Google© search engine. A website (Kestenbaum, 2005) revealed that a Frank Dillingham was the

FIGURE 1A. Quarry 249, July 9, 2006 with the author for scale. UTM coordinates for quarry 249: 12U 463,866; 5,621,513 (WGS 84), 670.546 metres above sea level. This picture taken from: 12U 463,846; 5,621,535 (WGS 84), looking roughly south. Photograph by Caleb Brown.

FIGURE 1B. Quarry 249 on July 9, 2006, looking down into the site. Old tree trunks, branches and milled lumber lies in the floor of the quarry. The straight cuts into the rock, showing the back wall and two sides of the excavation can be readily seen even after 92 years of erosion. Such vertical cuts are a hallmark of old quarries. The 1914 newspaper was found in the eroded scree slope below the author's right hand. Photograph by Caleb Brown at: 12U 463,869; 5,621,505 (WGS 84).

FIGURE 2. Want ads cartoon character found on cleaned newspaper fragment (left) in mystery quarry 1, with the on screen microfilm match (right) from page 21 of the Thursday, June 11, 1914 issue of The Manitoba Free Press. This cartoon character ("I AM A WANT AD") by artist DeForest Porter changed each day making microfilm comparisons easier.

American consul general in Manitoba in 1914 only. With this information the paper was tentatively identified as being from 1914, published, as evidenced by the dateline, on or soon after June 10, and probably in Winnipeg. A microfilm search was then conducted at the University of Calgary library to identify the source and date of issue of the newspaper pieces. The only major Manitoba newspaper the author was aware of was the Winnipeg Free Press so the search started there. After about a 10 minute search, a perfect match was made (Figure 2, right) with page 21 of the Thursday, June 11, 1914 issue of the Winnipeg-based newspaper Manitoba Free Press (original title for the Winnipeg Free Press).

Could the newspaper have been bought in a Winnipeg train station as an eastern-based paleontological crew came west? This distinct possibility was explored, but without resolution. Peter Kaisen's 1914 AMNH fieldnotes (on file at TMP library) show he arrived in DPP on June 8 and there joined the rest of the hired Alberta crew. He later states that Barnum Brown arrived in DPP on July 24. The Sternbergs arrived in DPP on June 6, according to the father's field notes (also on file at TMP library). A third and much smaller team, headed by William E. Cutler, were all Alberta based and C.H. Sternberg's fieldnotes for June 7 angrily speak of them already having their camp set up on what he considered his camping spot. All the field crews in Alberta that summer were already established before the newspaper found in mystery quarry 1 was printed, so it could not have been bought in Winnipeg and brought west with them.

With the 1914 date established, where mystery quarry 1 was located became another important clue. The Sternbergs first arrived in Dinosaur Provincial Park in 1913, the second of four years they were in competition with the AMNH. Although details were not recorded, in 1913, the DPP badlands were divided up into various territories that each respective museum could claim as their own prospecting and collecting area. As such, the spatial distribution of c.1913-1915 DPP mystery quarries is important. A review of the work done in the Park during this time period showed that only the AMNH

conducted fieldwork in that part of the Park in 1914. By agreement, the GSC crew and independent collector W.E. Cutler all worked farther downstream or the opposite side of the Red Deer River, with Cutler joining the AMNH crew soon after. Having bad luck far downriver, the Sternberg team did trespass into the eastern edge of the AMNH's large territory in 1914 resulting in some tensions.

As mentioned previously the pedal phalanges found in mystery quarry 1 were ceratopsian. A perusal of the AMNH 1914 field results (Brown, 1914) revealed that only three major ceratopsian specimens were collected that summer. One, AMNH 5342, was limited to the occipital region of a skull-much too small to have come from the large mystery quarry. The second specimen (AMHN 5351) was a complete adult *Monoclonius* (now = *Centrosaurus*), collected from quarry 105, a known, photographed (Brown, 1917:plate XV), and marked locality (Colbert, 1968:fig. 32; Sternberg, 1950; Currie and Russell, 2005). By process of elimination, the third and final specimen must have come from mystery quarry 1. This was another nearly complete adult *Monoclonius* (*Centrosaurus*), but one where the tail and one hind limb were eroded off prior to discovery. An animal of this type and size would readily fit into mystery quarry 1. It is likely the broken pedal phalanges and limb bone fragments found in 2005 and caudal vertebrae found in 2006 are the remnants of the eroded hind limb and tail. This specimen was originally curated as AMNH 5341, then later sold to the Yale Peabody Museum and renumbered YPM 2015 (Figure 3). YPM 2015 is a particularly important specimen, as it was extensively described and figured in the classic ceratopsian monograph by Lull (1933), used subsequently in several other important studies (Ostrom, 1966; Galton, 1970; Dodson, 1996; Dodson and Farlow, 1998; Christiansen and Paul, 2001; Chinnery, 2004), and on public display at YPM since 1933. Final confirmation is the stratigraphic position of the quarry; which is within the known range of other *Centrosaurus* quarries and bonebeds in DPP (Currie and Russell, 2005). The site was found in the lower third of the Dinosaur Park Formation, a zone recognized to contain *Centrosaurus* but no other members of the same subfamily. The relocation and identification of mystery quarry 1 serves as a test of this hypothesis and provides a more robust dataset towards this and future ceratopsian biostratigraphic studies (Ryan and Evans, 2005a,b).

The identification of mystery quarry 1 was a particularly important one, given the historical and scientific significance of the skeleton as a referred specimen. Finally identified 91 years later, mystery quarry 1 has been elevated to quarry status and now known in DPP as quarry 249. This was the 28th lost/mystery quarry found/solved in DPP and surrounding district since 1997 (Tanke, 2005a). During the 2006 field season, two more important lost DPP quarry sites were found (types of *Gryposaurus incurvimanus* and *Styracosaurus parksi*). Currently, over 25% of all the old quarries known from that area have been redocumented through this project. Travel time excepted, the entire time invested to identify the date and source of the cleaned newspaper fragments from mystery quarry 1 was only about 1 hour. While no doubt utilized in part by the AMNH crew, how a June 11, 1914 Winnipeg-based newspaper found its way into a remote dinosaur quarry in southern Alberta remains a curious mystery.

There are also potential spin off benefits of this site having been solved. Other mystery quarries in the area might now be identified because of the regularly observed "cluster effect" of quarries (one museum or collector/one area/one year). These nearby sites can now be reappraised in a new light. It is possible they were also excavated by the 1914 AMNH crew. Many more quarries remain to be found or identified in and around DPP, but the identification procedure gets a little easier each time one is resolved and sleuthing experience gained. It is hoped these efforts will inspire others to relocate long lost sites and identify their mystery quarries (e.g. Haugrud et al., 2001; Hunt and Lucas, 2003; Lucas and Sullivan, 2003; Sullivan, 2006) as relocating these lost sites is important for updated research (Irby, 1996; Sato and Wu, 2006). In those field areas with high resolution satellite photography, the use of Google Earth© may prove useful as the recent rediscovery of an Albertan GSC 1925 field camp (compared to archival motion picture footage) demonstrated. Using the elevation exaggeration, zoom and view tilt-down features in Google Earth©, the skyline, local topographical and vegetative features could be readily compared with digital stills captured and printed from the archival movie film.

The loss of data for important specimens, especially those collected by AMNH crews is especially telling. In the author's ongoing historical review and census of ceratopsian discoveries in Alberta, it appears that 71% of all AMNH ceratopsian quarries in DPP are unaccounted for. Prior to the discovery of quarry 249 and one other site, this figure was 86%. On the Red Deer River along the Tolman Bridge-Munson corridor upriver from Drumheller, AB precise quarry data are similarly scarce. Twenty-seven significant ceratopsian specimens were collected by AMNH, CMN, ROM, and the Drumheller and District Fossil Museum during 1911-1960. Of these, only 6 or 22%

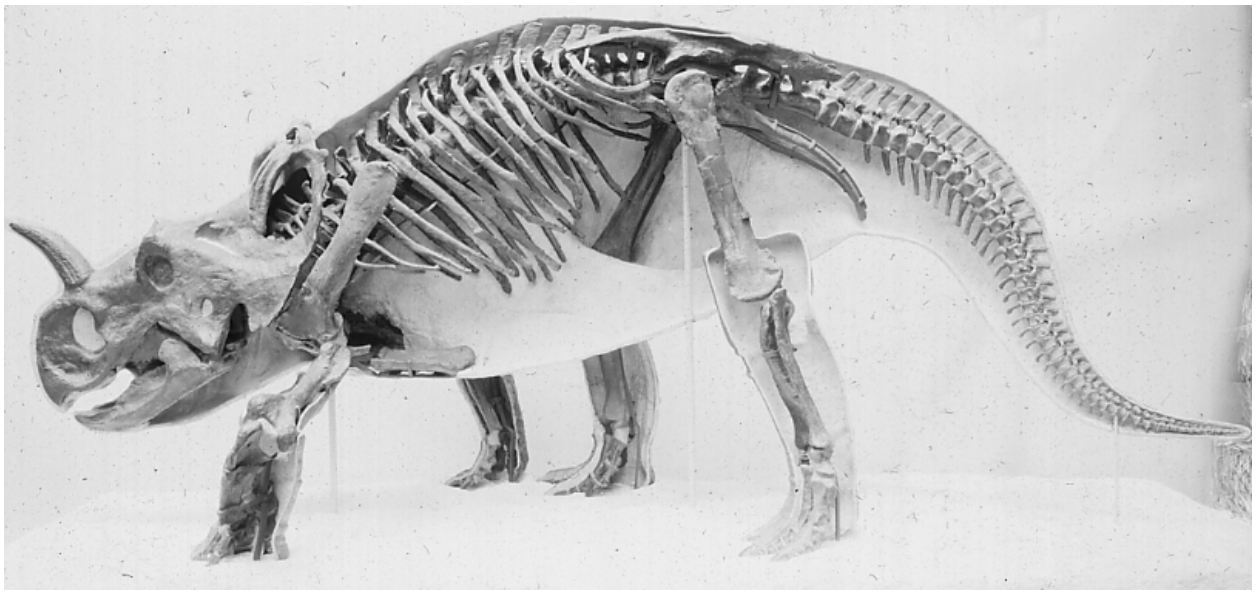

FIGURE 3. Mounted skeleton of *Centrosaurus apertus*, YPM 2015. Collected in 1914 from quarry 249 (ex mystery quarry 1), Dinosaur Provincial Park, AB. From Lull (1933).

have precise locality data. Such loss of locality data has a serious impact on subsequent studies where stratigraphic context is paramount. As an example, Dodson (1990) suggested that the horned dinosaurs *Centrosaurus* and *Styracosaurus* were possibly congeneric. While both are found in Dinosaur Provincial Park and elsewhere in southern Alberta, and have similar skulls (unspiked vs. spiked parietal in adults excepted), survey-grade GPS mapping of DPP quarries (MacDonald et al., 2005), demonstrated a different stratigraphic distribution in the Dinosaur Park Formation with *Centrosaurus* occurring low and *Styracosaurus* occurring mid-section and higher (Brinkman et al., 1998; Currie and Russell, 2005). This indicates they are likely separate taxa (Sampson et al., 1997). Similarly, three Albertan species of *Chasmosaurus* and some hadrosaur taxa (Currie and Russell, 2005; Evans and Ryan, 2005; Gates and Evans, 2005; Ryan and Evans, 2005a, b) also show good stratigraphic separation. Resolving these zonation issues requires a good sample size with precise locality data for each skeleton. Most of the AMNH specimens (of all types) and many collected by other institutions unfortunately cannot be utilized in these studies. The author continues to track these lost quarries, solving one or two a year thereby adding to this critical database.

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This paper is dedicated to the memory of René M. Vandervelde (1935-2006).

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